RLH Industries, Inc.

USER GUIDE

The leader in rugged fiber optic technology.

✓ *Unconditional Lifetime Warranty*

2010D-1001

RLH 16 T1 Over Gigabit Ethernet Fiber Optic Multiplexer System

IP transport of 16 T1/E1, 5 GE and 1 SFP GE optical over a single fiber

RLH-TG- 2C-1 T1 over Gigabit Ethernet

Introduction

As a cost effective solution for the traditional telecom services migrating to IP packet networking technology, the 16 Channel T1 over Ethernet (T1 over IP) adopts the innovative TDM over IP technology, with IP circuit emulation that supports transporting up to 16 T1/E1s, 5 GE electrical ports and 1 SFP GE optical port. The GE uplink ports and user data ports are IEEE 802.3 compliant, 10/100/1000M auto-sensing Ethernet ports. This is ideal for transporting T1/E1 over GE copper or fiber.

State-of-the-art design provides accurate timing signals and data bit stream reconstruction. Predefined system parameter profiles may be applied according to different application requirements. This system is also suitable for connecting to wireless equipment for rapid deployment of T1/E1 services.

Key Features

- 16 channels of E1/T1 over 1 Ethernet
- 5 GE TP ports and 1 GE optical port, all 6 GE ports may serve as network uplinks or users ports
- l IEEE 8802.3, 802.1Q, 802.1P compliant
- Supports SNMP V1/V2 network management
- Supports Ethernet spanning tree protocol which enables protection in ring and mesh topology with fast recovery
- Supports cascade concatenation for more than 16 T1 ports
- Supports VLAN on Ethernet and T1 ports
- Dual redundant power supplies
- EIA 1RU 19" rack mount or shelf mountable
- Covered by our Exclusive Unconditional Lifetime Warranty

T1/E1 GIG•E OVER FIBER

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Specifications subject to change without notice.

General Safety Practices

Intended Audience

This guide is intended for use by knowledgeable telco/network installation, operation and repair personnel. Every effort has been made to ensure the accuracy of the information in this guide is accurate. However, due to constant product improvement, specifications and information contained in this document are subject to change without notice.

Conventions

Symbols for notes, attention, and caution are used throughout this manual to provide readers with additional information, advice when special attention is needed, and caution to prevent injury or equipment damage.

The equipment discussed in this document may require tools designed for the purpose being described. RLH recommends that service personnel be familiar with the correct handling and use of any installation equipment used, and follow all safety precautions including the use of protective personal equipment as required.

Caution - Severe Shock Hazard

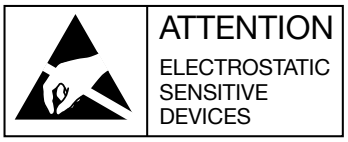
- Never install during a lightning storm or where unsafe high voltages are present.
- Copper network wires may carry high DC voltages. Use caution when handling copper wiring.

Warning

The intra-building port(s) of the equipment or subassembly is suitable for connection to intrabuilding or unexposed wiring or cabling only. The intra-building port(s) of the equipment MUST NOT be metallically connected to interfaces that connect to the OSP or its wiring. These interfaces are designed for use as intra-building interfaces only (Type 4 ports as described in GR-1089-CORE, Issue 4) and require isolation from the exposed OSP cabling. The addition of Primary Protectors is not sufficient protection in order to connect these interfaces metallically to OSP wiring.

Special handling requirements

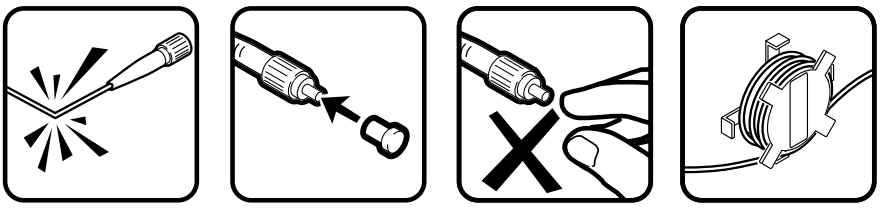
Be careful when handling electronic components



- This product contains static sensitive components.
- Do not open the enclosure, there are no user serviceable parts.
- Follow proper electrostatic discharge procedures.

This product utilizes circuitry that can be damaged by static electricity. Before installing, discharge static electricity on your body by physically making contact with earth ground. Failure to follow ESD precautions may cause damage to the unit and prevent proper operation.

Guidelines for handling terminated fiber cable



- Do not bend fiber cable sharply. Use gradual and smooth bends to avoid damaging glass fiber.
- Keep dust caps on fiber optic connectors at all times when disconnected.
- Do not remove dust caps from unused fiber.
- Keep fiber ends and fiber connectors clean and free from dust, dirt and debris. Contamination will cause signal loss.
- Do not touch fiber ends.
- Store excess fiber on housing spools or fiber spools at site

Acronyms

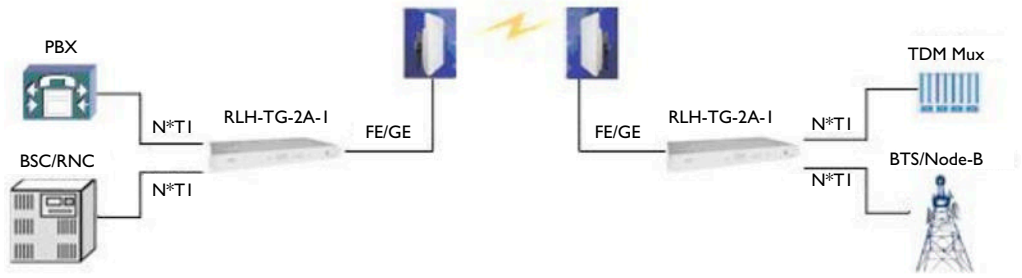
Commonly used acronyms and abbreviations

Acronym/Abbreviation	Description
UTP	Unshielded Twisted Pair (commonly used in Ethernet networks)
TP	Twisted Pair (same as UTP)
SFP	Small Form Factor Pluggable optical transceiver
TX	Transmit
RX	Receive
PWR	Power
LED	Light Emitting Diode
GRN	Green
ORG	Orange

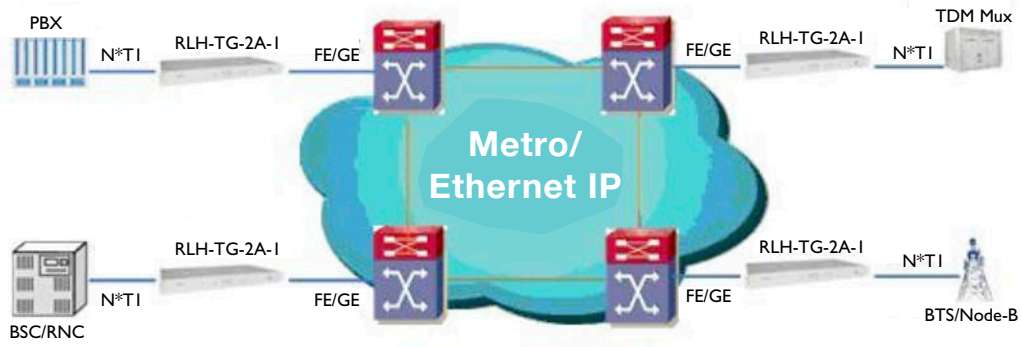
Applications

Network equipment in high voltage areas can be at risk due to Ground Potential Rise (GPR). A copper network cable referenced to a remote ground can become a path for high voltages during a ground fault. Use of all-dielectric fiber optic cable instead of copper completely eliminates the presence of a remote ground, which dramatically increases safety of personnel and reliability of equipment. By utilizing fiber optic cable, the 10/100/1000 Ethernet over fiber converter provides absolute electrical isolation between both ends of the network.

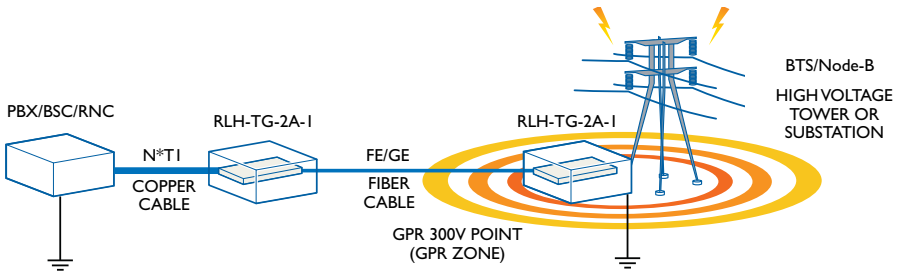
Copper twisted pair Ethernet is limited to 100m/328ft without extenders. Using fiber optic cable provides long distance service up to 80km/50mi. without any additional equipment. Optical fiber is immune to EMI/RF interference, ground loops, and high voltage surges from lightning or ground faults, and is ideal in electrically noisy environments such as near large power sources, electrical motors, and radio communications equipment.



Typical Application in a Wireless Network



Typical Application in a Wired Network



Typical HVP Application

RLH Industries, Inc. • Tel. 866-DO-FIBER • Fax 714 532-1885 • www.fiberopticlink.com

Installation

Prior to installation:

- Check for shipping damage
- Check the contents to ensure correct model and fiber type
- Have a clean, dry, DIN rail or wall mount installation environment ready

Required for installation:

- 48V~72VDC or 100~240VAC local power source, depending on the power supplies used

Note: In order to maintain high voltage isolation, Units at each end must be powered from separate isolated power sources.

Connect fiber optic cable

The 16x1 T1 System uses SFP optical modules. Remove the SFP dust cap and connect the fiber optic cable to the transceiver.

Note: Fiber cable should always be routed loosely avoiding tight bends.

Connect Ethernet cable

The 10/100/1000M copper connection is made via the RJ45 port. The TP ports are auto-negotiating and require no additional settings. Any or all of the TP ports may be used as upload or user ports, depending on your network topology.

Connect Power

Check to make sure that the power switches on the power supplies are OFF before connecting power.

DC Power

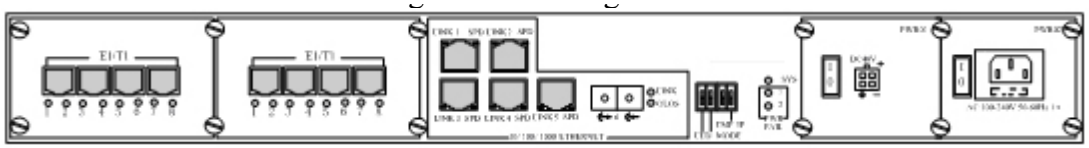
Use the supplied DC power connector to supply power to the DC Power supply. Connect a local 48VDC power supply to the power connector. The ground contact is a chassis ground, and must be connected to prevent damage or injury during high voltage events.

Note: The power terminals are polarity sensitive. Attach the Positive DC wire to the V+ terminal.

AC Power

Connect a local 115~240VAC power supply to the power connector using the supplied AC power cord.

LED Indicators



Front Panel

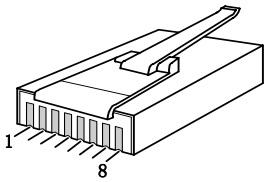
Indicator	Color	LED	Description
SYS	GRN	ON	System configuring or failure
		Blinking	Normal system operation
		OFF	System failure
PWR FAIL	RED	ON	Power OFF/failure
		OFF	Power normal
LINK	GRN	ON	Optical Ethernet port connected to remote device
		OFF	Optical Ethernet port disconnected from remote device
OLOS	RED	ON	Optical Ethernet port receive failure
		OFF	OPtical Ethernet port normal
LINK	GRN	ON	Ethernet TP port link OK
		Blinking	Ethernet TP port link OK with activity
		OFF	Ethernet TP port inactive
SPD	GRN	ON	Ethernet TP port speed is 1000M
		OFF	Ethernet TP port speed is 10/100M
T1 1 ~ 8	RED	ON/OFF	T1 interface indicator has various states depending on the DIP switch setting. See DIP switch table for additional information

DIP Switches

Label	Switch Number	Definition	Setting	LED	Description	Notes
LED_MODE	1	T1 packet loss alarm indicator	ON	ON	Ethernet interface cannot receive T1	Only when DIP switch 2 is set to OFF will this setting be valid.
				OFF	Ethernet interface has T1 packet loss	
				Blinking	Normal operation	
		T1 signal alarm status indicator	OFF	ON	T1 interface signal loss	
				OFF	T1 interface signal AIS alarm	
				Blinking	T1 interface signal loss	
	2	Remote equipment link status Indicator	ON	ON	Addressing remote MAC	
				OFF	Not addressing remote MAC	
		-	OFF	-	Set according to DIP switch No. 1	
NO_VLAN	3	Software VLAN	ON	-	Software VLAN Disabled	Use caution not to configure VLAN list incorrectly or management may be disabled
			OFF	-	Software VLAN set is valid	
TMP_IP	4	IP address setting	ON	-	Default IP address 192.192.192.192	
			OFF	-	Manually set IP address	

T1 Port Connections

There are 4 ports on each T1 module, and each port carries 2 T1 channels. The T1 port impedance is 120Ω for twisted pair cables and uses RJ45 connectors. T1 adapter cables are included with each unit. Refer to the pin out chart below.

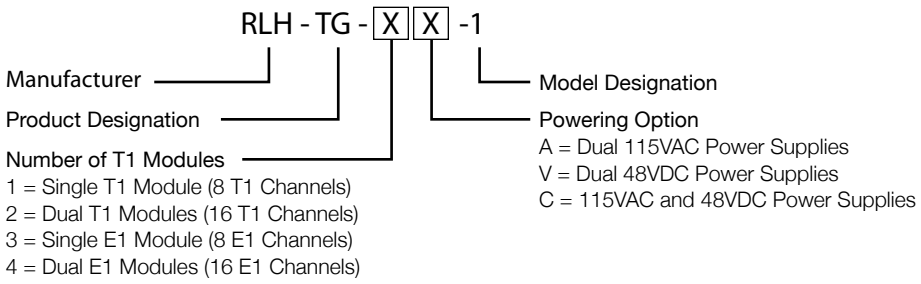


RJ-45 connector pin diagram

RJ-45 Pin	T1 Signal	Twisted Pair	Recommended Color
1	IN (1) –	Pair	Blue
2	IN (1) +		Blue White
3	OUT (1) +	Pair	Orange
4	OUT (1) –		Orange White
5	IN (2) –	Pair	Green
6	IN (2) +		Green White
7	OUT (2) +	Pair	Brown
8	OUT (2) –		Brown White

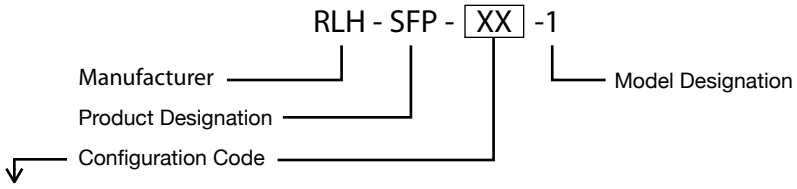
Ordering Information

16 Channel T1 over Ethernet Multiplexer System


RLH - TG - X X -1
Manufacturer
Product Designation
Number of T1 Modules
1 = Single T1 Module (8 T1 Channels)
2 = Dual T1 Modules (16 T1 Channels)
3 = Single E1 Module (8 E1 Channels)
4 = Dual E1 Modules (16 E1 Channels)
Model Designation
Powering Option
A = Dual 115VAC Power Supplies
V = Dual 48VDC Power Supplies
C = 115VAC and 48VDC Power Supplies

- Optical SFP transceivers ordered separately, one SFP required per chassis.

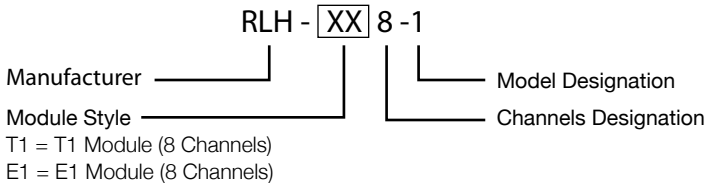
SFP Optical Transceivers



Code	Multimode	Single Mode	Single Fiber Bi-Directional	Dual Fiber	SC Connector	LC Connector	0.5km/0.3mi. range	2km/1.25mi. range	20km/12.4 mi. range	40km/24.9 mi. range	60km/37 mi. range	80km/50 mi. range	C Side	S Side	Either Side
01	●		●		●			●					●		
02	●		●		●			●						●	
03	●			●		●	●								●
10		●	●		●			●					●		
11		●	●		●			●						●	
12		●	●		●				●				●		
13		●	●		●				●					●	
14		●	●		●					●			●		
15		●	●		●					●				●	
20		●	●			●			●				●		
21		●	●			●			●					●	
22		●	●			●				●			●		
23		●	●			●				●				●	
30		●		●		●			●						●
31		●		●		●					●				●
32		●		●		●						●			●

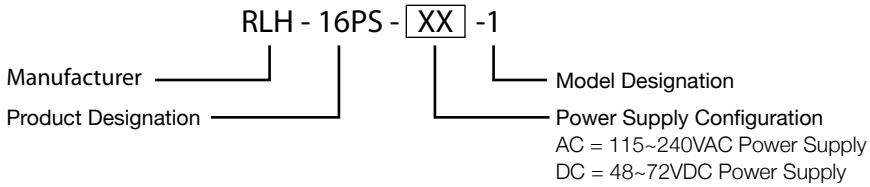
- Bidirectional single fiber SFP systems require a “C” unit and an “S” unit for a complete system
- Please contact your RLH sales representative for pricing and delivery information

Replacement/Spare T1 modules



- Each T1/E1 Module has 8 Channels
- Two T1/E1 modules may be installed into each chassis
- Please contact your RLH sales representative for pricing and delivery information

Replacement/Spare Power Supplies



- Each chassis holds two power supplies
- Please contact your RLH sales representative for pricing and delivery information

Troubleshooting

If trouble is encountered, verify all copper and fiber connections. Refer to the LED Indicators on of the unit. They show availability of power, modes of operation, and data being received by the fiber and TP ports.

If trouble persists, replace the unit and retest. If technical assistance is required, contact the RLH Industries, inc. technical support department:

800-877-1672 (6 am to 6 pm- PST),
or call our 24/7 Technical/Customer Service: (714) 366-2503 or (714) 457-5740

General Specifications

Model	RLH-16T1-!P-01	16 T1 5 GE electrical ports 1 GE SFP optical port
Interfaces	IP Ports	5 GE electrical ports and 1 GE SFP optical port Complies with IEEE 8802.3, 802.1Q, 802.1P Speed and duplexing auto-negotiating or manual selectable
	T1 Ports	16 T1 ports supported in 2 plug-in modules/B8ZS Complies with G.703 Impedance: 120Ω E1 or 75Ω T1
NM Port	Same as IP Ports	Web server and SNMP management supported
Power	Supply	Pluggable dual power supplies
		2 - DC or 2- AC or DC+AC
		48V~72VDC@1A or 100~240VAC@1A
	Consumption	≤ 15W
Working Environment	Temperature	-4°F to +140°F (-20°C to +60°C)
	Relative Humidity	≤90% non-condensing
Dimensions	W x H x D	17.3in. x 1.7in. x 9.1 (1RU) (440mm x 44mm x 231mm)

Warranty

RLH is recognized throughout the U.S. and offers the only **UNCONDITIONAL LIFETIME WARRANTY** in the telecommunications industry. We are very proud of our warranty which simply states that our Fiber Optic Link Assemblies are warranted to be free of defects in material and workmanship for the **LIFE OF THE PRODUCT**.

RLH will replace this product, or part thereof, if it fails FOR ANY REASON, provided the defective part is returned to RLH Freight prepaid. This warranty is UNCONDITIONAL and valid even when this product has been abused, mishandled, or damaged as a result of a natural disaster. This warranty will reduce your costs and simplify your maintenance activities. Not all RLH products are covered by this warranty.

To make a warranty claim, or schedule repair or replacement of your RLH product, please contact us for an RMA number. You will be promptly assisted by one of our warranty specialists. All returns must have an RMA number before we can receive any items.

Technical Support

Normal technical support hours (Mon - Fri 6am - 6pm PST)	Local (714) 532-1672 Toll Free (800) 877-1672 Toll Free (866) DO-FIBER
24/7 Technical support	(714) 366-2503 (714) 457-5740

Contact Information

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